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NATIONAL LABORATORY

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TA-53 Facility Management

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TA-53 Procedure

Cooling Tower and Water Treatment Operation

53 FIR 230-00-01

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1.0 Introduction

Cooling towers that discharge to NPDES outfalls must be operated in compliance with the NPDES permit parameters. All cooling towers must be operated in accordance with LANL Operations and Maintenance Manual, Section 400, Criterion 402-Water Treatment of Open Cooling Units.

2.0 Purpose

This procedure provides instructions for operating cooling tower water treatment systems. The procedure is based on a control system with an integrated water treatment and level control panel. These panels use LMI Conductivity Controllers and Strantrol ORP Controllers.

3.0 Scope

These instructions apply to the following cooling towers located at TA-53. They become effective for each tower when the control system installation and commissioning are complete:

MPF-60 & Equip. Bldg. MPF-61
MPF-62 & Equip. Bldg. MPF-63
MPF-64 & Equip. Bldg. MPF-65
MPF-293 & Equip. Bldg. 1038
MPF-1032 & Equip. Bldg. 961
MPF-952 & Equip. Bldg. 950

These instructions do not apply to air washers and evaporative coolers.

Cooling towers that are connected to the sanitary sewer may be operated in accordance with this procedure with the appropriate adjustments (i.e. these towers have no need for a neutralizer pump or tank; therefore, verifying operation of the neutralizer pump is not required).

4.0 Responsibilities

If you are a	**Then you must**
Water Treatment Technician	• follow this procedure and keep required records.
Maintenance & Operations Team Leader	• ensure that the M&O staff implement the procedure.
Maintenance Coordinator	• ensure that the SSS is scheduled as required and follows this procedure.
Facility Mechanical	• review tower log sheets and keep this procedure up

Engineer	to date.
Facility Manager	• provide oversight for the implementation and use of this procedure.

5.0 Precautions And Limitations

5.1 Failure to follow the requirements in this procedure could lead to exceedance of the permit parameters at one or more of the NPDES outfalls. This could lead to fines or suspension of programmatic activities.

6.0 Procedure

6.1 LANL Water Treatment Technician Rounds:

6.1.1 **Three times per week**:

a. Record data in the tower log sheet in the PC – a customized log sheet is provided for each cooling tower. All data fields for the specific tower are to be filled in. The spreadsheet will perform all required calculations. The data listed in the log sheet meets or exceeds the requirements of LANL Operations and Maintenance Manual Criterion 402-Water Treatment of Open Cooling Units.
b. Check chemical log sheets and enter data into PC
c. Verify conductivity controller setup parameters
d. Check tower physical condition and note any significant changes
e. On completion of rounds, backup log sheet files
f. Compare conductivity controller reading with conductivity meter reading. If the difference is more than 20 micromhos, clean probe and calibrate the controller.
g. Compare cycles of concentration based on conductivity and make-up/blowdown readings. If there is a discrepancy, check the following:
    1) Conductivity controller operation – does blowdown valve operate when conductivity is above setpoint?
    2) Conductivity controller calibration
    3) Conductivity controller setup parameters
    4) Make-up meter operation – does meter register flow when make-up valve is open?
    5) Blowdown meter operation – does meter register flow when blowdown valve is open?
    6) Make-up valve operation and leakage
    7) Blowdown valve operation and leakage
h. Verify that the tower chemical concentration is in within expected limits by a molybdate test. Adjust pump runtime per pulse in conductivity controller and speed/stroke as necessary to correct concentration.
i. Conductivity reading should be within 20 micromhos of setpoint.

1) If reading is low, check blowdown valve and/or make-up valve leakage
2) If reading is high check blowdown valve operation

j. HRR reading should be within 20 mV of setpoint.
   1) If reading is low, verify that the brominator solenoid valve opens when the reading is below setpoint.
   2) If reading is high, verify that the brominator solenoid valve closes when the reading is above setpoint.

6.1.2 **Weekly**:

a. Verify correct operation of the make-up valve by pushing the make-up test button and observing opening and closing of the valve. Valve should open for approximately 2 minutes. Check operation of the make-up meter.
b. Verify correct operation of the blow-down valve by pushing the blowdown test button and observing opening and closing of the valve. Valve should open for approximately 2 minutes. Check operation of the blowdown meter. Also verify that the neutralizer pump operates during blowdown.
c. Fill sample bottles with basin water from MPF-60, 62, and 64 for arsenic analysis. Transmit samples to CST-9 for analysis
d. Enter arsenic analysis results in log sheets for MPF-60, 62, and 64
e. Print out one copy and file in the log sheet binders
f. Backup log sheet files

6.1.3 **Monthly**:

a. Fill sample bottles with basin water for MPF-60, 62, 64, and 950 for full chemical analysis. Fill one sample bottle with make-up water for full chemical analysis. Transmit samples to CST-9 for analysis.
b. Calculate cycles of concentration based on Ca, Mg, and SiO_2 shown on full chemical analysis. Compare with cycles of concentration from log sheets.

6.2 Support Services Subcontractor Craftsman Rounds:

6.2.1 **Three times per week (minimum)**:

a. Check level in tower chemical tank, neutralizer tank, and brominator tank – top off tanks as required
b. Sample basin water for chlorine content – record reading on log sheet
c. Sample blowdown stream for chlorine content – record reading on log sheet. Activate blowdown by pushing blowdown test button. Sample is to be taken at blowdown sample port, not at outfall.
d. Check for leaks in chemical injection lines
e. Check for leaks in treatment control system piping
f. Check distribution basins for algae, if substantial schedule cleaning
g. Check water treatment control strainer. Clean if necessary.
h. Check for conductivity, low level, high level and HRR alarms. Contact Building Manager or Maintenance Coordinator if there is an alarm.

6.3 Alarm Response:

6.3.1 High Level Alarm Response:

a. Check to see if water is flowing in make-up line. If it is, close manual valve in make-up line.
b. Check to see if level controls are calling for make-up, i.e. MTR-B energized
c. Check for debris holding make-up valve open

6.3.2 Low Level Alarm Response:

a. Check operation of make-up valve
b. Check to see if water is flowing in blowdown line. If it is, close manual valve in blowdown line.
c. Check to see if conductivity controls are calling for blowdown, i.e. Blowdown light on conductivity controller is on.
d. Check for debris holding blowdown valve open
e. Check cooling tower system piping for leaks or unauthorized taps
f. Check basin drain valve

6.4 Conductivity Controller Operations:

6.4.1 Setup parameters: See Liquitron DC4000 Series Conductivity Controller Instruction Manual for definition of parameters and steps to make changes.

a. Conductivity Setpoint – see log sheet
b. Differential – 20 µS
c. Low Alarm – 100 µS max. below setpoint
d. High Alarm – 100 µS max. above setpoint
e. Feed – Pulse
f. Setup
    1) Flow Alarm – On
    2) Trip - ↑
    3) Disp Units - µS
    4) Control – Clgtwr

6.5 ORP Controller Operations:

6.5.1 Setup parameters: See Strantrol 870 Controller Manual for definition of the parameters and steps to make changes.

a. Setpoint – see log sheet
b. P1 DISP – NUMERIC
c. P2 Rly 1 – Up
    1) A2 - On
    2) Ovf - Off
d. P3 Rly 2

1) B1 Alarm

e. B3 NO

f. Lo 100 max. below setpoint

g. Hi 100 max. above setpoint

h. P4 Cal

1) Pt1 – 600

2) Pt2 – 800

i. P5 4-20

4mA – 600 (not critical)

20mA – 800 (not critical)

7.0 Required Records

7.1 Cooling tower log sheets shall be maintained on the water treatment laptop computer and copied to the Maintenance Coordinator's computer. Printed copies of the log sheet shall be maintained in the Maintenance and Operations Office. These records shall be retained for a minimum of three years.

8.0 References

LANL Operations and Maintenance Manual, Section 400, Criterion 402-Water Treatment of Open Cooling Units
Operations and Maintenance Manual for EPA Category 03A Outfalls

9.0 Attachments

Conductivity Meter Operations Manual
ORP Meter Operations Manual
Injection Pump Operations Manual